AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Previously Presented): An apparatus for processing input sample sets of at least one discrete multi-tone (DMT) modulated communication channel, and the apparatus comprising:

- an input memory storing each input sample set as a two-dimensional array of rows and columns of samples;
- an output memory storing two-dimensional arrays of rows and columns of coefficients resulting from a corresponding one of a time-to-frequency domain transformation and a frequency-to-time domain transformation of each input sample set; and
- a two-dimensional Fourier transform circuit coupled between the input and output memory to perform the corresponding transformation of the input sample set and having:
    - row transform components including a Radix-R butterfly having "R" inputs and "R" output nodes; and the row transform components generating partial row transforms limited to solutions to a single unsolved one of the "R" output nodes of the Radix-R butterfly on each of the "R" iterations through ordered sets of samples from each input sample set; and
    - column transform components coupled to the row transform components and configured to generate complete column transforms from the partial row transforms generated by the row transform components prior to a completion of the "R" iterations through each input sample set by the row transform components; thereby to reduce an interval required to transform each successive input sample set.

Claim 2 (Canceled)

Claim 3 (Previously Presented): The apparatus of Claim 1, wherein the input memory further comprises:

- "R" separate memories each storing contiguous blocks of columns of the two-dimensional array or rows and columns of samples of each input sample set, and each of the "R" separate memories coupled to a corresponding one of the "R" inputs of the Radix-R butterfly.

Claim 4 (Canceled)

Claim 5 (Currently Amended): The apparatus of Claim 1, wherein further the ~~at least one~~ at least one discrete multi-tone (DMT) modulated communication channel comprises a first DMT communication channel associated communications on a first subscriber line and a second DMT communication channel associated with communications on a second subscriber line, and the first and second DMT communication channels differing from one another in a number of samples per sample set.

Claim 6 (Previously Presented): The apparatus of Claim 1, wherein the row transform components begin processing the next sample set before the column transform components have completed all the column transforms on a prior sample set.

Claim 7 (Previously Presented): The apparatus of Claim 1, wherein the ordered sets of samples processed by the row transform components further comprise samples separated

from one another in each row of the input memory by a spacing substantially equal to a number of columns in the input sample array divided by "R".

Claim 8 (Currently Amended): The apparatus of Claim 1, wherein the row transform components further perform a frequency-to-time domain partial transformation of an input sample set of 4096 samples by generating successive partial solutions in row order to a two-dimensional inverse discrete Fourier transformation (IDFT) identified in the following Equation 1A in which n_r and n_c are time domain row and colum indices respectively, in which k_r and k_c are row and column in the frequency domain and in which W notates correspoonding twiddle factors:

$$x(n_c, n_r) = \frac{1}{4096} \sum_{k_r=0}^{63} \left(\sum_{k_c=0}^{63} X(k_c, k_r) W_{64}^{-n_c k_c} \right) W_{4096}^{-n_c k_r} W_{64}^{-n_r k_r}$$

in which the ordering of the partial row transforms generated by the row transform components on each of "R" iterations through the input sample set corresponds with the processing of each row of the input sample set in accordance with the following Equation 1B:

$$x(n_1, n_2) = \sum_{k_2=0}^{15} \left(\sum_{k_1=0}^{3} X(k_1, k_2) W_4^{-n_1 k_1} \right) W_{64}^{-n_1 k_2} W_{16}^{-n_2 k_2}$$

in which n_1 is fixed at a single value for an iteration through the input sample set and n_2 is varied, and for each subsequent iteration n_1 is incremented to the next value of n_1 and n_2 is varied.

Claim 9 (Currently Amended): The apparatus of Claim 1, wherein the row transform components further perform a time-to-frequency domain partial transformation of an input sample set of 4096 samples by generating successive partial solutions in row order to a two-dimensional discrete Fourier transformation (DFT) identified in the following Equation 2A <u>in which n_r and n_c are time domain row and colum indices respectively, in which k_r and k_c are row and column in the frequency domain and in which W notates corresponding twiddle factors</u> :

$$x(k_c, k_r) = \sum_{n_r=0}^{4096} \left(\sum_{n_c=0} X(k_c, k_r) W_{64}^{n_c k_c} \right) W_{64}^{n_r k_c} W_{64}^{n_r k_r}$$

in which the ordering of the partial row transforms generated by the row transform components on each of "R" iterations through the input sample set corresponds with the processing of each row of the input sample set in accordance with the following Equation 2B:

$$x(k_1, k_2) = \sum_{n_2=0}^{15} \left(\sum_{n_1=0}^{3} X(n_1, n_2) W_4^{n_1 k_1} \right) W_{64}^{n_2 k_1} W_{16}^{n_2 k_2}$$

in which n_1 is fixed at a single value for an iteration through the input sample set and n_2 is varied, and for each subsequent iteration n_1 is incremented to the next value of n_1 and n_2 is varied.

Claim 10 (Currently Amended): The apparatus of Claim 1, wherein the two-dimensional Fourier transform circuit further reduces ~~the~~ <u>an</u> interval required to perform a frequency-to-time domain transformation of an input sample set which exhibits hermetian symmetry by avoiding partial row transforms of approximately half the rows which are mirror reversed conjugates, and in which further the column transform components further provide a

conjugation operation to expand the number of rows output to the output memory to correspond with the number of rows in the input sample set.

Claim 11 (Canceled)

Claim 12 (Previously Presented): A method for processing input sample sets of at least one discrete multi-tone (DMT) modulated communication channel, and the method comprising:

- storing each input sample set as a two-dimensional array of rows and columns of samples;
- generating partial row transforms limited to solutions to a single unsolved one of the "R" output nodes of the Radix-R butterfly on each of "R" iterations through ordered sets of samples from each input sample set stored in the storing act; and
- *generating complete column transforms from the partial row transforms generated in* the first generating act prior to a completion of the "R" iterations through each input sample set in the first generating act; thereby to reduce an interval required to transform each successive input sample set from a corresponding one of a time-to-frequency domain and a frequency-to-time domain.

Claim 13 (Canceled)

Claim 14 (Previously Presented): The method of Claim 12, wherein the storing act further comprises:

- storing contiguous blocks of columns of the two-dimensional array or rows and columns of samples of each input sample set, in each of "R" separate memories coupled to a corresponding one of the "R" inputs of the Radix-R butterfly.

Claim 15 (Canceled)

Claim 16 (Previously Presented): The method of Claim 12, wherein further the at least one discrete multi-tone (DMT) modulated communication channel comprises a first DMT communication channel associated communications on a first subscriber line and a second DMT communication channel associated with communications on a second subscriber line, and the first and second DMT communication channels differing from one another in a number of samples per sample set.

Claim 17 (Previously Presented): The method of Claim 12, wherein the first generating act further comprises:

beginning processing a next sample set before generating in second generating act an entire set of column transforms on a prior sample set.

Claim 18 (Previously Presented): The method of Claim 12, wherein the ordered sets of samples processed in the first generating act further comprise samples separated from one another in each row of the input memory by a spacing substantially equal to a number of columns in the input sample array divided by "R".

Claim 19 (Currently Amended): The method of Claim 12, wherein the partial row transforms in the first generating act for a frequency-to-time domain transformation of an input sample set of 4096 samples conform with successive partial solutions in row order to a two-dimensional inverse discrete Fourier transformation (IDFT) identified in the following Equation 1A <u>in which n_r and n_c are time domain row and colum indices respectively, in</u>

which k_r and k_c are row and column in the frequency domain and in which W notates correspoonding twiddle factors:

$$x(n_c, n_r) = \frac{1}{4096} \sum_{k_r=0}^{63} \left(\sum_{k_c=0}^{63} X(k_c, k_r) W_{64}^{-n_c k_c} \right) W_{4096}^{-n_c k_r} W_{64}^{-n_r k_r}$$

in which the ordering of the partial row transforms generated by the first generating act on each of "R" iterations through the input sample set corresponds with the processing of each row of the input sample set in accordance with the following Equation 1B:

$$x(n_1, n_2) = \sum_{k_2=0}^{15} \left(\sum_{k_1=0}^{3} X(k_1, k_2) W_4^{-n_1 k_1} \right) W_{64}^{-n_1 k_2} W_{16}^{-n_2 k_2}$$

in which n_1 is fixed at a single value for an iteration through the input sample set and n_2 is varied, and for each subsequent iteration n_1 is incremented to the next value of n_1 and n_2 is varied.

Claims 20-21 (Canceled)

Claim 22 (Currently Amended): The method of Claim 12, wherein the first generating act further comprises performing a time-to-frequency domain partial transformation of an input sample set of 4096 samples by generating successive partial solutions in row order to a two-dimensional discrete Fourier transformation (DFT) identified in the following Equation 2A in which n_r and n_c are time domain row and colum indices respectively, in which k_r and k_c are row and column in the frequency domain and in which W notates correspoonding twiddle factors:

$$x(k_c, k_r) = \sum_{n_r=0}^{4096} \left(\sum_{n_c=0} X(k_c, k_r) W_{64}^{n_c k_c} \right) W_{64}^{n_r k_c} W_{64}^{n_r k_r}$$

in which the ordering of the partial row transforms generated in the first generating act on each of "R" iterations through the input sample set corresponds with the processing of each row of the input sample set in accordance with the following Equation 2B:

$$x(k_1, k_2) = \sum_{n_2=0}^{15} \left(\sum_{n_1=0}^{3} X(n_1, n_2) W_4^{n_1 k_1} \right) W_{64}^{n_2 k_1} W_{16}^{n_2 k_2}$$

in which n_1 is fixed at a single value for an iteration through the input sample set, and n_2 is varied and for each subsequent iteration n_1 is incremented to the next value of n_1 and n_2 is varied.

Claim 23 (Previously Presented): The method of Claim 12, wherein the first and second generating acts further comprise:

- limiting partial row transforms in the first generating act, on an input sample set which exhibits hermetian symmetry, to approximately half the rows by avoiding partial row transforms of rows which are mirror reversed conjugates; and
- providing in the second generating act a conjugation operation to expand a number of rows output to correspond with the number of rows in the input sample set, thereby further reducing the interval required to transform each successive input sample set from the frequency domain to the time domain.